INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

Serial No. 1107
(G.c.)

Document No. 56

DISTRIBUTION OF PELAGIC EGGS AND LARVAE OF COMMERCIAL FISHES IN THE NORTH-WEST ATLANTIC AREA

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Spawning may be considered as the least studied link in the life circle of commercial fishes in the North-West Atlantic Area. It is still unknown the precise location of spawning grounds, time and duration of spawning in different areas, drift and survival of eggs and larvae of commercial fishes.

These questions cannot be solved without studying ichthyoplankton (pelagic eggs and fish larvae). Dannevig, 1918, was the first who made description of eggs and larvae of 36 species of fish in the North-Atlantic area. Since that time there had not been accomplished any special investigation in ichthyoplankton but fragmentary information may be found in the works by Bigelow and Schroeder (1953), Steel D.H. (1957), Templeman W. (1959). The last circumstance as well as lack of identification tables for eggs and larvae in the North-West Atlantic area make treatment of ichthyoplankton samples difficult. One has to use summaries and identification tables compiled for European seas (Pertseva, 1936; Rass, 1949; Ehrenbaum, 1905-1909. Duncker et al., 1929; Schmidt I., 1907). Ichthyoplankton was sampled in divisions 21, 3K, 3L, 3M, 3N, 30 on board the R/V "Sebastopol" in July-August, 1959 and in March-April and July-August, 1960. In 1961, material from the same areas was obtained from R/V "Novorossiysk" (April-May) and R/V "Odessa" (June-July). Besides that, in 1961, material was collected in the divisions 4V, 4W, 4X, 5Z on board the research vessels "Bogutshar" and "Balaklava". Ordinary conical egg nets (diameter of the opening - 80 cm. gaze No. 140) were used for sampling. There were performed by one vertical hauling from the bottom to the surface at each station of the standard hydrological section with the depths over 50 m; the samples were taken within the water column from 500 to 0 meters. More than 500 samples were collected and treated. Species composition of ichthyoplankton was represented by eggs and larvae of 23 species belonging to 12 families. Of this number the distribution of eggs and larvae of five commercial species (silver hake, haddock, cod, redfish, American plaice) as well as the same of two non-commercial fishes (sand eel which is of great significance in feeding of cod and haddock, and lemon sole whose eggs were unknown so far in the north-west Atlantic area) is considered in present paper.

Silver Hake (Merluccius Bilinearis, Mitchell)

Eggs of silver hake are found in the number from 2 to 14 per haul performed in June near the south-eastern coast and in the shelf waters of the New Scotland along 67°W section as well as in the northern part of Georges Bank (see Fig 1A). In July collection of ichthyoplankton was made in the Grand Bank area where eggs mainly at the 1st and 2d stages of development were observed on the southern slope above the depths varying from 60 to 800 m (see Fig.1B). Species identity of Merluccius bilinearis eggs was determined by their likeness in structure and pigmentation with eggs of M. merluccius found near European coast. Diameter of silver hake eggs

(0.72-0.95 mm) was somewhat less than that of the hake eggs from the North Sea (0.94-1.27).

Haddock (Melanogrammus aeglefinus, Linne)

In April, when ichthyoplankton samples were collected only in the area of the New Scotland shelf, individual eggs of haddock at all stages of development were observed north-east of New Scotland and south-east of Sable Island above the depths ranging from 90 to 275 m (see Fig. 2A).

In May work was carried out on Grand Bank. Eggs of haddock occurred on the north-eastern, eastern, south-western slopes and in the shallow waters of the southern portion of the Bank over the depths varying from 50 to 1500 m (see Fig. 2B). In June the investigations were accomplished in the Georges Bank area. Eggs were found on the slopes of Georges Bank and of adjacent Browns Bank. Individual larvae of 6 to 11 mm in length were found also on the northern slope of Georges Bank. Neither eggs nor larvae of haddock were observed there in July and August.

Cod (Gadus morhua morhua Linne)

Within the vast area extending from Labrador of Georges Bank eggs of cod were found in different localities during the whole period of investigations from March to August Eggs of the I, II and III stages of development (with prevalence of the I stage) were distributed on the continental slope in the south part of the Labrador area, on the northern slope of the Grand Bank, on the south-western and north-eastern slopes of the Flemish Cape, on the south-west of the Grand Bank and on the Green Bank. In the area of New Scotland individual specimens of eggs occurred on the slope of a shelf in vicinity of Sable Island as well as to the south of Browns Bank (Fig.3A)

In the month of May collection of cihthyoplankton was performed on the slopes of Grand Bank, Flemish Cape and on Georges Bank. Eggs of the I-IV stages of development (with prevalence of the I stage) were discovered along all the slopes of Grand Bank and on the northern slope of Georges Bank (see Fig. 3B). The number of eggs varied from 1 to 25 per haul. Diameter of eggs ranged from 1.3 mm to 1.7 mm in April - May larvae of 13-17 mm long were observed in the Georges Bank area.

By the end of June sections were worked out in the southern t and in the southern part of Labrador area on the latitude of Belle Isle. In June eggs of early stages of development were discovered also along the north-and-south-eastern shores of New Scotland.

In July material was collected on the slopes of Grand Bank, Flemish Cap and along a section off Labrador. There were taken up to 45 eggs per haul near Labrador Gulf and on Hamilton Bank. Eggs were found on the north and south-eastern slopes as well as in the shallow waters of Grand Bank. In the area of Flemish Cap they were observed in the central part of the bank and on the wouth-western slope. (Fig.3C). In August samples were taken from the Strait of Cabot and Saint-Pierre Bank. Solitary specimens of eggs were found on the southern slope of Bank and on the western and eastern slopes of the Cabot Strait.

Pre-larvae of cod were discovered in June and July in the southern part of Labrador area, along the eastern coast of Newfoundland as well as on the eastern and north-eastern slopes of Grand Bank.

American Sand ell (Ammodytes Americans De Kay)

Pre-larvae and larvae of sand eel were the most widely distributed components of ichthyoplankton. Several thousands of pre-larvae from 5.0 to 8.0 mm long were found on March 8th, on the eastern slope of Grand Bank (43°57'N, 50°18'W) at the depth of 55 m. In April larvae occurred off New Scotland, over the depth of 100 mm. In May great quantities of larvae were distributed in the shallow waters of Grand Bank and on the south-western slope. In July, larvae occurred in the same areas, but in less number. Number of larvae per one haul taken in March exceeded 2000 specimens, in May - 150, in July - 30. The length of larvae was from 5.0 to 8.0 mm in March, from 5.5 to 21 mm in May, and from 8 to 38 mm in July.

Redfish (Sebastes spp.)

Species identity of redfish larvae of Sebastes family was not ascertained, therefore their distribution is given without division by species. Larvae may be splitted into two groups according to their size and degree of development:

1) pre-larvae ranging from 5.0 to 10.0 mm in length

2) larvae (LI and LVI) from II.0 to 20.0 mm in length

In March-April pre-larvae were found in the southern part of Green Bank and individual speciemns - in the area of New Scotland Shelf, to the south Sable Island. In May the density of distribution of pre-larvae in the area of the north-eastern slope of Grand Bank and the southern slope of Flemish Cap was found to be nearly 140 specimens per vertical haul. In less amount (up to 20 specimens) larvae were observed on the eastern and south-western slopes of Grand Bank (Fig.5A). In June the samples were collected in the area of New Scotland only, where larvae were found in the waters of Cape Breton and in the Browns Bank area. In July-August larvae were distributed in the southern part of the Labrador area, mainly on the slope, to south-east from Newfoundland on the latitude of Bell Isle, on the south-eastern, eastern and south-western slopes of Grand Bank as well as along all the slopes of Flemish Cap Bank (Fig. 5B). In these areas pre-larvae occurred over depths from 200 m to 1000 m. Advanced and non-advanced larvae (LI and LII) from 12 to 20 mm long were observed only in July-August and only in the central part of Flemish Cap Bank over the depths of 145-200 m.

American Plaice. Hippoglossoides platessoides

limandoides (Block)

Eggs of American plaice occurred in the catches of egg-nets from May to August.

In May, eggs were found on the north-eastern, northern and south-western slopes of Grand Bank (Fig. 6A). By the end of June and in July they were distributed in south of Labrador, near the eastern coasts of Newfoundland, to north-east of the Island, on the north-and-south-eastern slopes as well as in the shallow waters of the southern part of Grand Bank and in the Flemish Cap area too (see Fig. 6B). The largest amount of eggs (up to 50 specimens per haul) were found in the Labrador Area and in the waters of Flemish Cap. Eggs were distributed over the depths of 60 m - 500 m. Diameter of larvae varied from 2,2 mm to 2,9 mm with II and III stages of development prevailing. Pre-larvae of the American plaice from 4,9 to 6,1 mm long occurred off the eastern coast of Newfoundland, on the north-eastern slope of Grand Bank and in the Flemish Cap area.

Lemon Sole, Microstomus microcephalus (Donovan)

Neither adult forms of lemon sole, nor moreover its eggs were observed earlier off Atlantic coasts of North America. Eggs of lemon sole were found near coasts of south Labrador, in the Grand Bank area as well as close to the coasts of New Scotland in 1959-1960. In 1962 they were observed in the waters of Cape Breton, in the Cabot Strait, on the slope of the Sable Island area and on the Browns Bank too. Diameter of eggs ranged from 1,2 mm to 1,5 mm. They were distributed over the depths of 60 m to 1000 m. Basing upon the knowledge of distribution of eggs and larvae at early stages of development one can form an idea as to the time and locality of spawning of main commercial fish species.

1. Silver hake spawns in June on Georges Bank and in the New Scotland area as well, but in July it spawns on the southern slope of Grand Bank.

2. Spawning of haddock is observed in the Nova Scotian area. In May haddock spawns on the edges and shallow waters of Grand Bank which is proved by occurrence of haddock eggs distributed in the mentioned areas.

3. Spawning period of haddock in the areas surveyed lasts from March till August. Eggs are found both in the extreme southern and northern areas in the beginning of spawning period (in May-April) as well as towards the end of it (in July-August). Spawning grounds are located in the coastal waters and in the bank areas.

4. Extrusion of redfish larvae takes place in May on the north-eastern and south-eastern slopes of Grand Bank as well as on the southern slope of Flemish Cap Bank.

5. American plaice spawns from May to July over the depths not exceeding 500 m in the areas of Grand Bank, Labrador and Flemish Cap.

Captions

for the paper "Distribution of pelagic eggs and larvae of commercial fishes in the north-west Atlantic area".

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Fig. I
a. Distribution of silver hake eggs in June.
b. Distribution of silver hake eggs in July.

Fig. 2
a. Distribution of haddock eggs in April.
b. Distribution of haddock eggs in May.

Fig. 3
a. Distribution of cod eggs in March-April.
b. Distribution of cod eggs in May.
c. Distribution of cod eggs to the end of June, July and August.

Fig.4
Distribution of American sand eel larvae.

Fig. 5
a. Distribution of redfish larvae in March-April.
b. Distribution of redfish larvae in July-August.

Fig. 6 a. Distribution of American plaice eggs in May.
b. Distribution of American plaice eggs in June-July.

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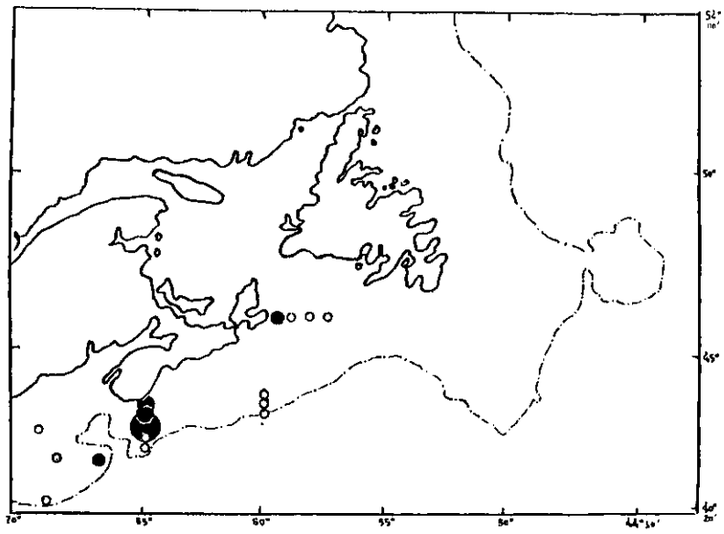


A

Distribution of silver hake eggs in June.

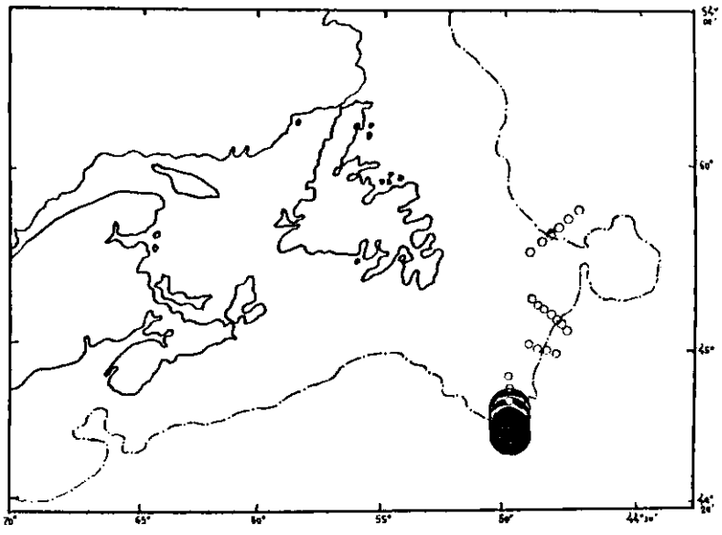
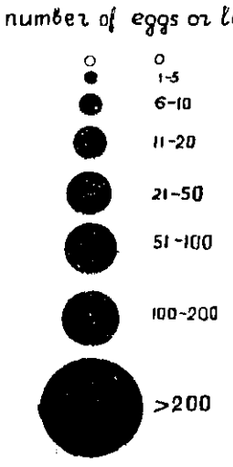
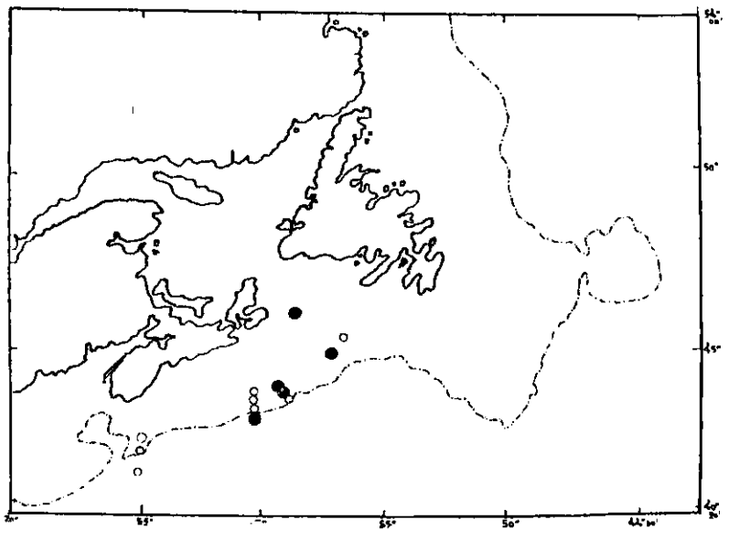


Figure I.

B

Distribution of silver hake eggs in July.





A
Distribution of haddock eggs in April.

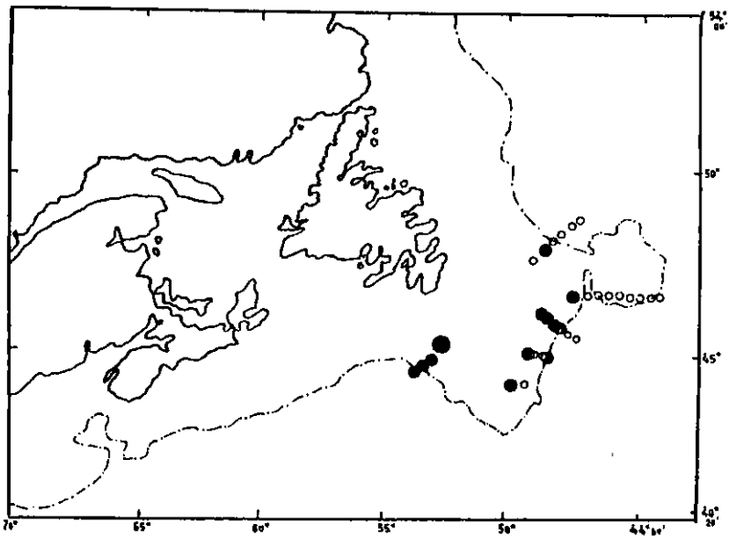
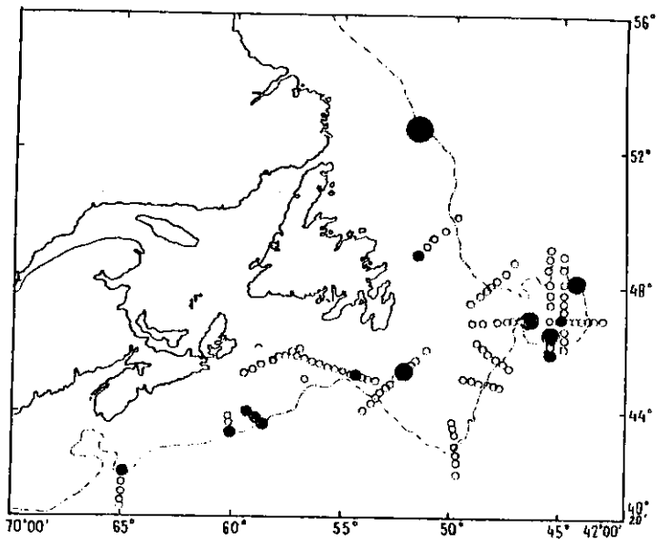


Figure 2.

B
Distribution of haddock eggs in May.



A

Distribution of cod eggs in March-April

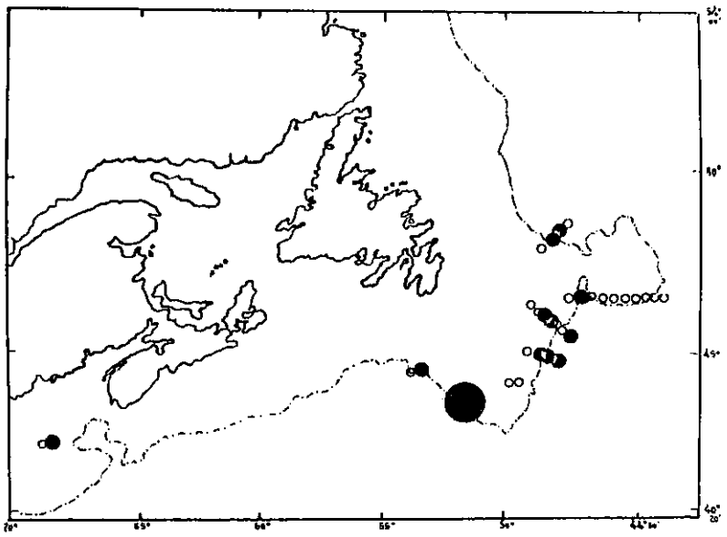
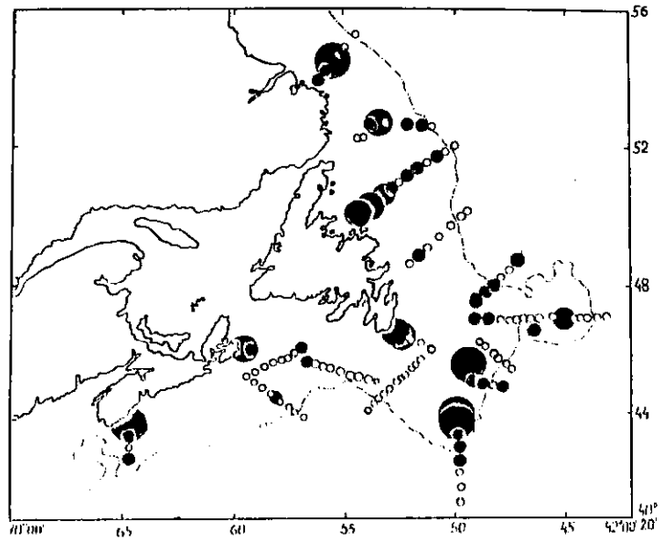


Figure 3.

B

Distribution of cod eggs in May.



C

Distribution of cod eggs to the end of June, July and August.

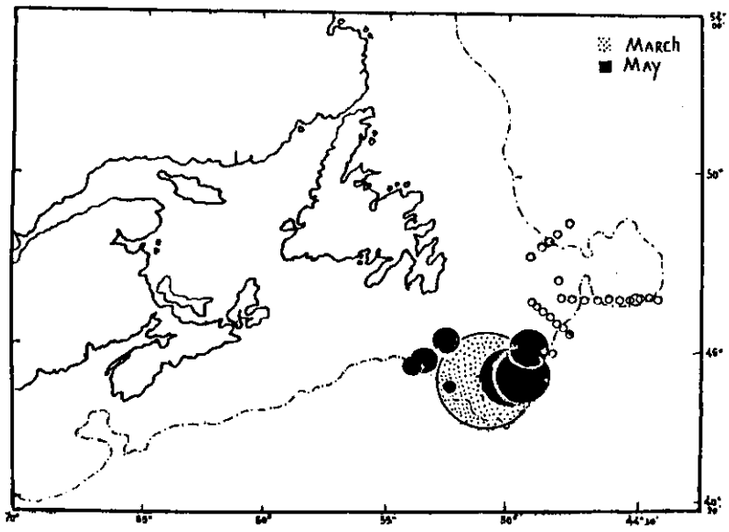
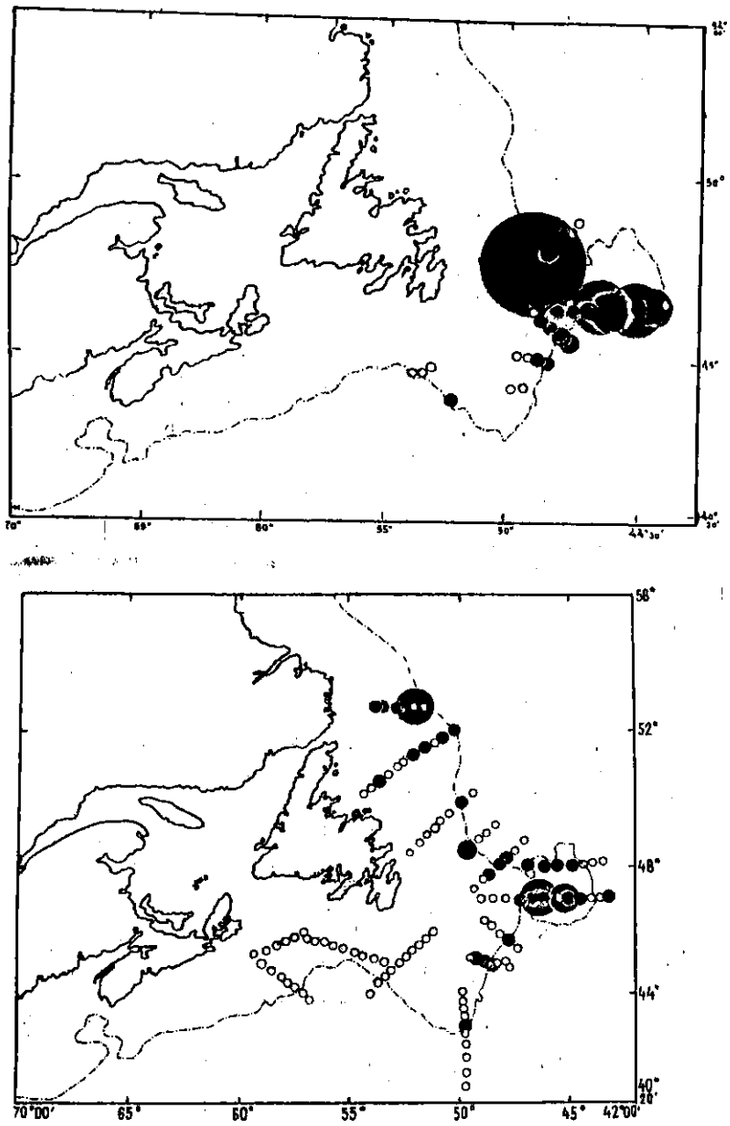


Figure 4.

Distribution of American sand eel larvae.



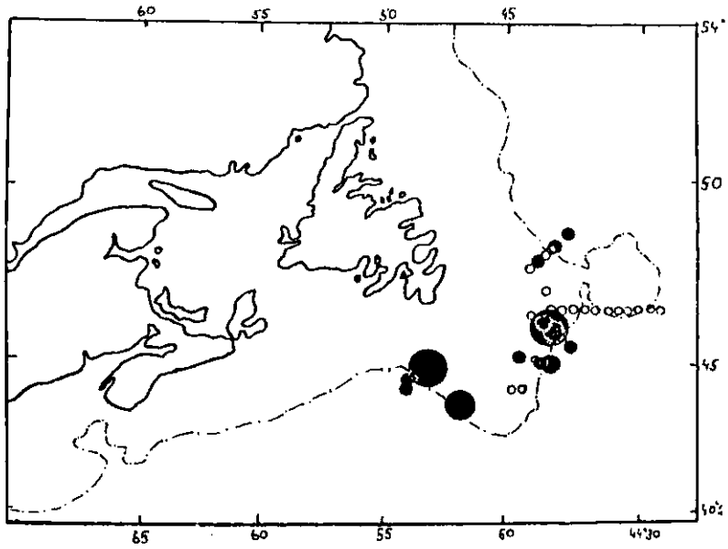
A

Distribution of redfish larvae in March-April

Figure 5.

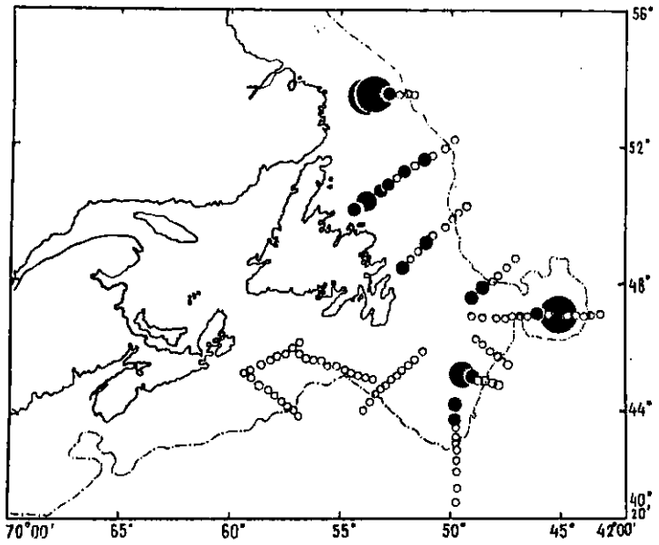
B

Distribution of redfish larvae in July-August.



A

Distribution of American plaice eggs in May.



B

Distribution of American plaice eggs in June-July.

Figure 6.